College of Southern Nevada

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Laboratory Safety

Environmental Health & Safety

Presented by: Environmental Health & Safety

May 7, 2024

Overview

- **Controlling Chemical Exposure**
  - Engineering Controls
  - Administrative Controls
  - Safe Work Practices
  - Personal Protective Equipment
- **Chemical Emergencies**

Why are we doing this?

- 29 CFR 1910.1450 Occupational Exposures to Hazardous Chemicals in the Laboratory (i.e., The Laboratory Standard):
  - Chemical procedures are carried out on a “laboratory scale” (easily handled by one person).
  - Multiple chemical procedures or chemicals are used.
  - The procedures are not part of a production process.
  - “Protective laboratory practices and equipment” are available and in common use to minimize the potential for worker exposure to hazardous chemicals.

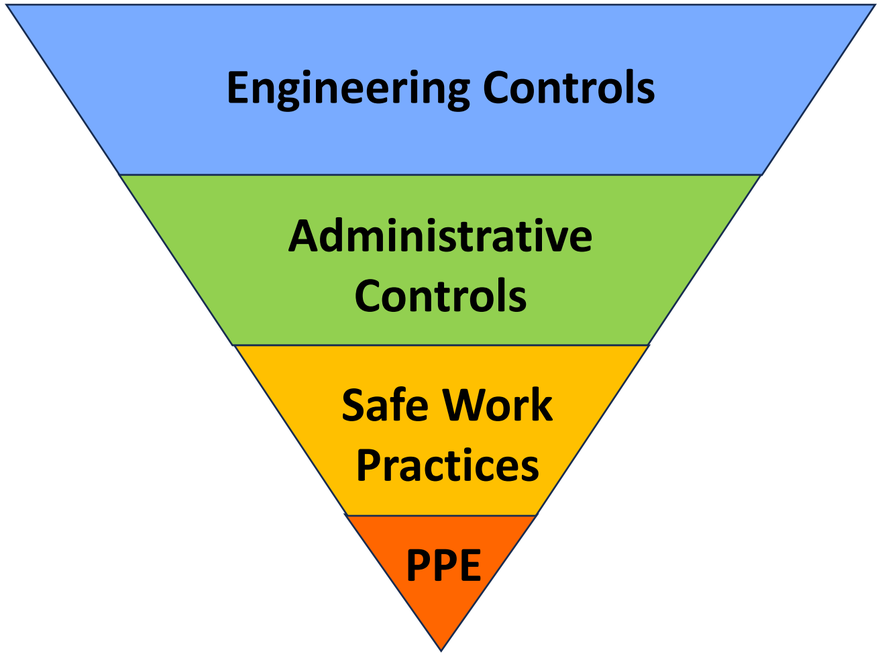
Understand the Hazards!

- Know the potential hazards and appropriate safety precautions of the chemicals you work with.
- Ask the following questions:
  - What are the hazards?
  - What are the worst things that could happen?
  - What do I need to protect myself?
  - What controls, work practices, or personal protective equipment are needed to minimize the risk?

Controlling Chemical Exposure

1. **Engineering Controls**
   - Primary method of controlling chemical exposures.
2. **Administrative Controls**
   - Work procedures to reduce the duration, frequency, and severity of exposure to chemicals.
3. **Safe Work Practices**
   - Guidelines and procedures implemented to ensure people are safe while working.
4. **Personal Protective Equipment (PPE)**
   - Equipment worn to minimize exposure to a variety of hazards.

Hierarchy of Controls



Engineering Controls

The primary method of controlling chemical exposure!

Fume Hoods

- Use when working with extremely volatile chemicals.
- Keep all chemicals and equipment six inches from the sash.
- Hood should always be ON during use.
- Recommended velocity at 100 fpm.
- Keep the sash at or below the “safe” (<sash level>) level when experiments are not in progress or unattended.
- Do not use for long term chemical storage.
- Wear gloves, safety glasses, etc., as appropriate.
- Clean all chemical residues from the hood chamber after each use.

Biosafety Cabinets

- Use slow, controlled movements to reduce disrupting the air curtain.
- Keep sterile media and equipment on one side. As material becomes contaminated, move to the opposite side.
- When you are finished, leave the BSC blower running for 2-3 minutes to purge all the chamber air.
- Wipe down materials and cabinet surfaces with disinfectant and remove everything from cabinet.
- Turn off cabinet, close sash, remove personal protective equipment, and wash hands.

Local Exhaust Ventilation (LEV)

- Good for capturing fumes during small tasks and disconnecting process lines.
- *Flanged* opening increases capture of contaminants.
- Place flanged opening as close to the contaminants as possible.
- Need to ensure adequate capture velocity at various distances.

Autoclaves

- Autoclaves generate high heat and pressure.
- Use thick gloves when handling hot items.
- After cycle completion, allow the autoclave to cool down before opening.
- When cool, open doors slowly to allow excess steam to escape.
- Do not stack or store combustible materials, cardboard or plastic containers, next to autoclaves.
- Never autoclave materials containing toxic agents, volatile chemicals, or radionuclides.

Refrigerators

- Chemicals stored in refrigerators should be:
  - Sealed and double packaged, if possible
  - Labeled with the name of the material, date placed in the refrigerator, and the name of the person who stored the material.
- Doors should be labeled:
  “NO FOOD – CHEMICAL STORAGE ONLY.”
- For refrigerators used to store food, doors should read, **“FOOD STORAGE ONLY – NO CHEMICALS.”**
- Food should never be stored in the same refrigerator with chemicals.

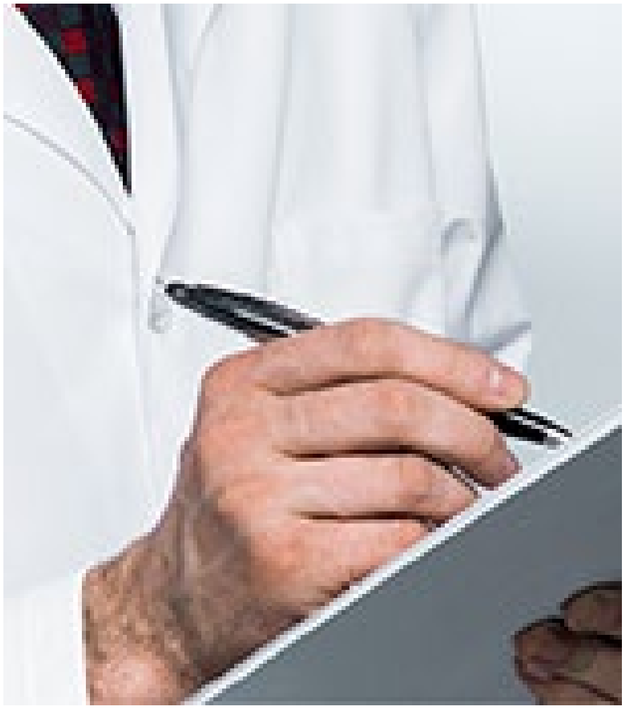
Administrative Controls

Work procedures to reduce the duration, frequency, and severity of exposure to chemicals.

Laboratory Inspections

Why are lab inspections important?

- Help to ensure compliance with regulations, standard safety procedures and practices.
- Raise safety awareness.
- Help ensure the safety and health of laboratory personnel.
- Control costs.
- Improve productivity.



Inspections should be conducted before the start of each semester, and annually by EH&S.

Laboratory Inspection Checklist

The lab inspection checklist includes:

- General Safety
- Chemical Storage and Handling
- Fire Safety
- Personal Protective Equipment
- Emergency Equipment
- Biological and Chemical Wastes
- Compressed Gases
- Biological Safety

Appendix A - Laboratory Safety Inspection Checklist (Biological & Physical Sciences / Health Sciences)

LABORATORY SAFETY INSPECTION CHECKLIST

Date:	Inspected By:	
Department:	Supervisor:	
Campus:	Building:	Room:

For each item check Yes, No, or N/A. Be sure to retain all documentation regarding inspections, including findings and corrective actions taken for any "No" responses, for a minimum of 3 years. Contact EH&S for questions or additional information.

GENERAL SAFETY	YES	NO	N/A
1. Laboratory Safety Plan is present, updated (annual review required), and includes emergency information?			
2. CSN Chemical Hygiene Plan available in the lab?			
3. Emergency contact numbers posted in the laboratory?			
4. Lab is maintained secure; door is locked when no one is in lab?			
5. Lab floors, aisles, exits and adjacent hallways unobstructed?			
6. Broken glassware is not in use; glassware is properly discarded in designated containers?			
7. Lab is adequately organized and cleaned to provide sufficient workspace for operations without spills, accidents, or other preventable incidents?			
8. Floors dry and free of slip hazards?			
9. No evidence of food or drink storage or consumption?			
10. Appropriate warning signs posted on outside of door?			
11. *No Food or Drink' or 'Not for Human Consumption'* warning signs posted on outside of refrigerators, ice machines, and microwaves?			
12. Hand washing sink is available with towels and soap present?			
13. All equipment guards are in place?			
14. Laboratory electrical panels accessible and unobstructed?			
15. Extension cords only used temporarily, and power strips not daisy-chained together?			
16. Equipment with motors, heaters, and other high amperage needs plugged directly into a wall receptacle?			
17. Electrical or extension cords free of exposed wiring?			
CHEMICAL STORAGE & HANDLING	**YES**	**NO**	**N/A**
18. Lab personnel know how to access Chemical Inventory and Safety Data Sheets?			
19. Appropriate labels are found on all chemical containers and secondary containers (No abbreviations/formulas)?			
20. Chemical containers are kept closed when not in use?			
21. No corroded/compromised chemical containers?			
22. Benchtops, fume hoods, biosafety cabinets organized and clean?			
23. Chemical storage cabinets properly labeled and kept closed when not in use?			
24. Storage cabinets clean and free from spilled material?			

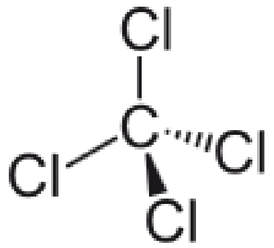
Process Changes

Changes to methods or processes to reduce exposure!

- Substitute a less toxic chemicals.
- Reduce the amount of the chemical being used.
- Reduce the length of the exposure time.
- Use plastic equipment instead of glass.

All are encouraged to look for and suggest changes in procedures to reduce exposure!

Chemical Substitution



Tetrachloromethane (Carbon Tetrachloride)

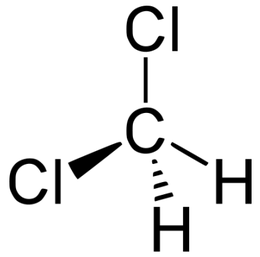
GHS Label elements, including precautionary statements

Pictogram 

Signal word: Danger

Hazard statement(s)
H301 + H311 + H331: Toxic if swallowed, in contact with skin or if inhaled

TWA	5 ppm
STEL	10 ppm



Dichloromethane (Methylene Chloride)

GHS Label elements, including precautionary statements

Pictogram 

Signal word: Warning

Hazard statement(s)
H303 + H313: May be harmful if swallowed or in contact with skin.

TWA	50 ppm
STEL	125 ppm

TWA – Time Weighted Average (8 hours)

STEL – Short-term Exposure Limit (~15 minutes)

Safe Work Practices

Guidelines and procedures implemented to ensure people are safe while working!

Safe Work Practices

- Programs and Procedures
- Chemical Labeling
- Safety Data Sheets (SDS)
- Chemical Storage and Handling
- Transporting Chemicals
- Housekeeping
- Personal Hygiene

Chemical Hygiene Plan

- Purpose & Scope
- Procedure
  - Responsibilities
  - Training
  - General Guidelines
  - Hazard Communication
  - Chemical Storage and Segregation
  - Transporting Chemicals
  - Personal Protective Equipment
  - Environmental Monitoring
- Medical Program
- Housekeeping and Maintenance
- Laboratory Safety Inspections
- Chemical Purchases
- Hazardous Waste Management
- Accidents, Emergencies and Chemical Spills
- Recordkeeping
- Definitions
- Appendices

https://www.csn.edu/__data/assets/pdf_file/0021/174405/CSN-Chemical-Hygiene-Plan_Jan.2023.pdf

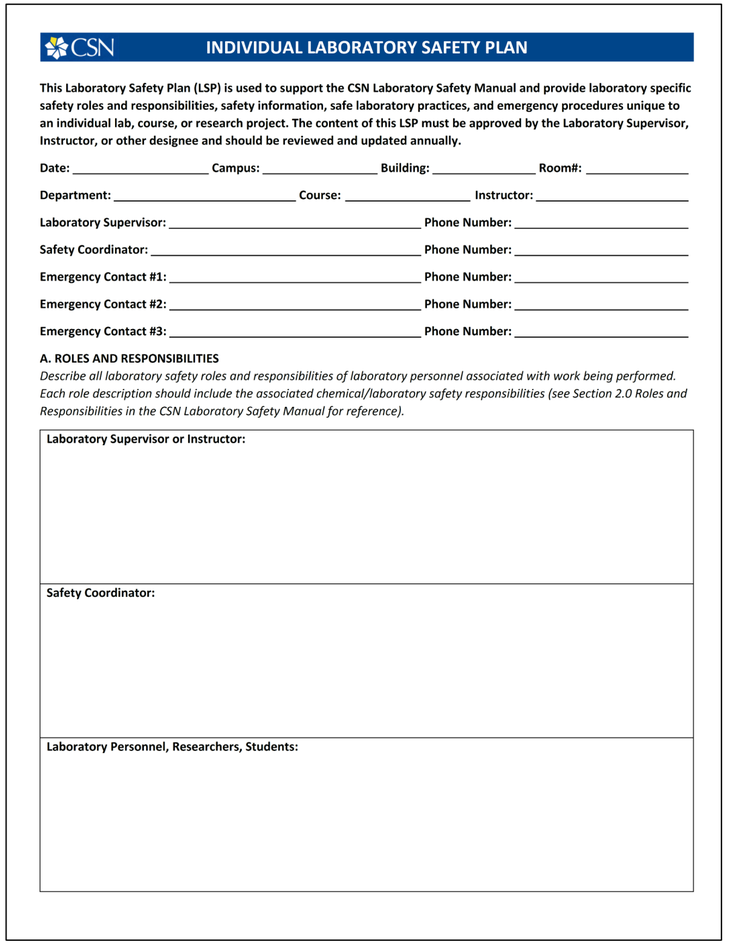
Laboratory Safety Manual

- Purpose & Applicability
- Roles and Responsibilities
- Emergency Procedures
- Chemical and Biological Hazard Identification
- Health Hazards of Chemicals
- Health Hazards of Biological Agents
- Controlling Exposure to Chemicals and Biological Agents
- Safe Work Practices & Procedures
- Spills and Exposures
- Laboratory Waste Disposal and Equipment Handling
- Appendices:
  - Appendix B – Individual Laboratory Safety Plans

https://www.csn.edu/_csnmedia/documents/emergency-preparedness/CSN-Laboratory-Safety-Manual.pdf

Individual Laboratory Safety Plans

- Provides laboratory specific safety roles and responsibilities, safety information, safe laboratory practices, and emergency procedures unique to an individual lab, course, program, or research project.
- Act as an easy reference for laboratory personnel and students that augments the CSN Laboratory Safety Manual, Chemical Hygiene Plan, and other laboratory-specific Standard Operating Procedures.
- Does not replace current written safety plans.
- Ongoing implementation process through the EH&S Lab Inspection Program.



CSN **INDIVIDUAL LABORATORY SAFETY PLAN**

This Laboratory Safety Plan (LSP) is used to support the CSN Laboratory Safety Manual and provide laboratory specific safety roles and responsibilities, safety information, safe laboratory practices, and emergency procedures unique to an individual lab, course, or research project. The content of this LSP must be approved by the Laboratory Supervisor, Instructor, or other designee and should be reviewed and updated annually.

Date: _____ **Campus:** _____ **Building:** _____ **Room#:** _____

Department: _____ **Course:** _____ **Instructor:** _____

Laboratory Supervisor: _____ **Phone Number:** _____

Safety Coordinator: _____ **Phone Number:** _____

Emergency Contact #1: _____ **Phone Number:** _____

Emergency Contact #2: _____ **Phone Number:** _____

Emergency Contact #3: _____ **Phone Number:** _____

A. ROLES AND RESPONSIBILITIES

Describe all laboratory safety roles and responsibilities of laboratory personnel associated with work being performed. Each role description should include the associated chemical/laboratory safety responsibilities (see Section 2.0 Roles and Responsibilities in the CSN Laboratory Safety Manual for reference).

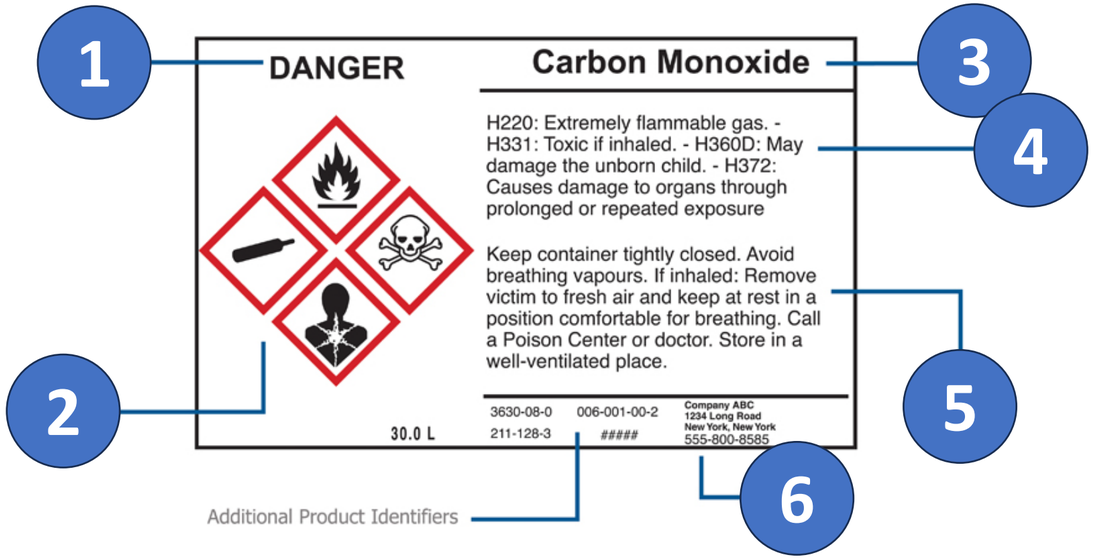
Laboratory Supervisor or Instructor:
Safety Coordinator:
Laboratory Personnel, Researchers, Students:

Chemical Labeling

Labels must include:

- Full chemical name or names (no chemical formulas).
- Include the appropriate signal word; “Danger” or “Warning”.
- Include a hazard statement, such as “flammable” or “toxic”. You can find the required information on the primary container label or the SDS.
- Ensure all containers are labeled.

Globally Harmonized System (GHS)



1. Signal Words

   Danger or Warning

2. Pictogram(s)
3. Product Identifier
4. Hazard Statement(s)

   Standardized and assigned phrases that describe the hazard(s) as determined by the hazard classification.

5. Precautionary Statement(s)

   Phrases that describe recommended measures to minimize or prevent adverse effects resulting from exposure and/or improper storage or handling.

6. Manufacturer’s Information

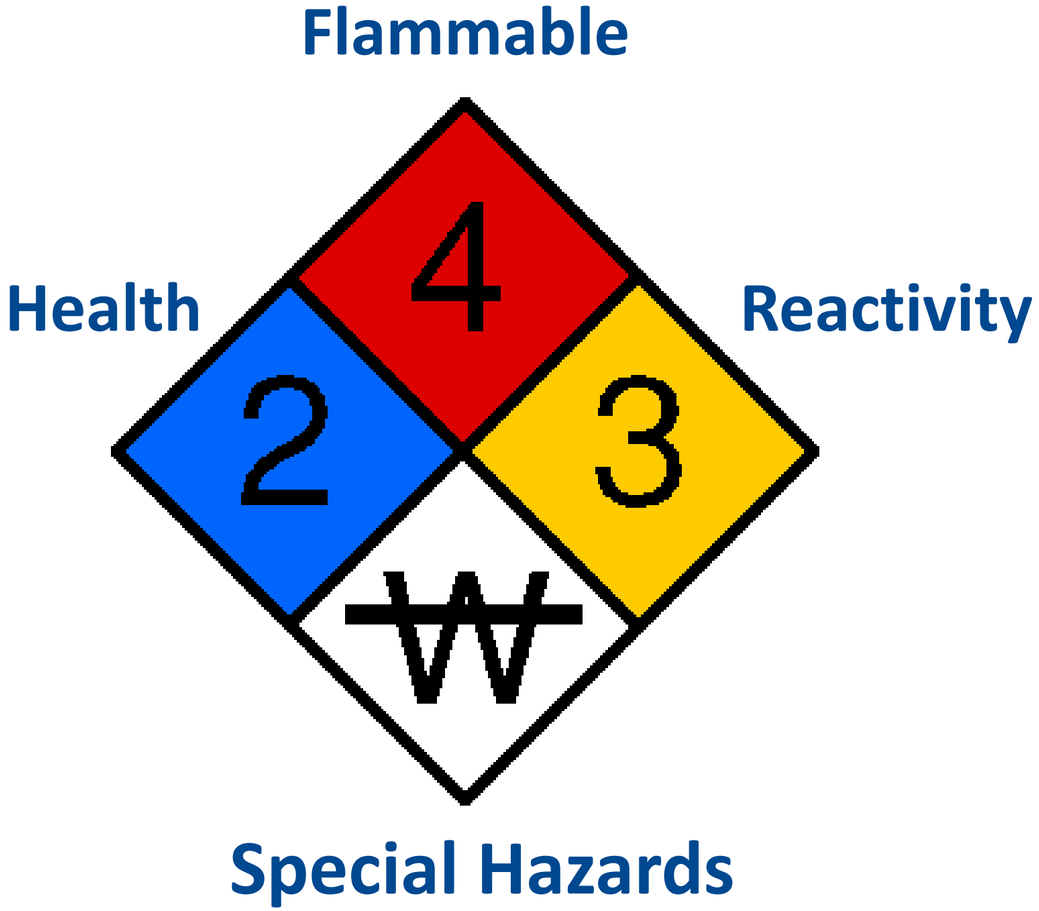
GHS Pictograms

	**Exploding Bomb** ***(for explosion or reactivity hazard)***		**Flame** ***(for fire hazard)***		**Flame over Circle** ***(for oxidizing hazard)***
	**Gas Cylinder** ***(for gases under pressure)***		**Corrosion** ***(For corrosive damage to metals as well as skin, eyes)***		**Skull and Crossbones** ***(can cause death or toxicity with short exposure to small amounts)***
	**Health Hazard** ***(may cause or suspect of causing serious health affects)***		**Exclamation Mark** **(may cause less serious health effects or damage the ozone layer)**		**Environment** ***(may cause damage to the aquatic environment)***

NFPA 704M Labeling System

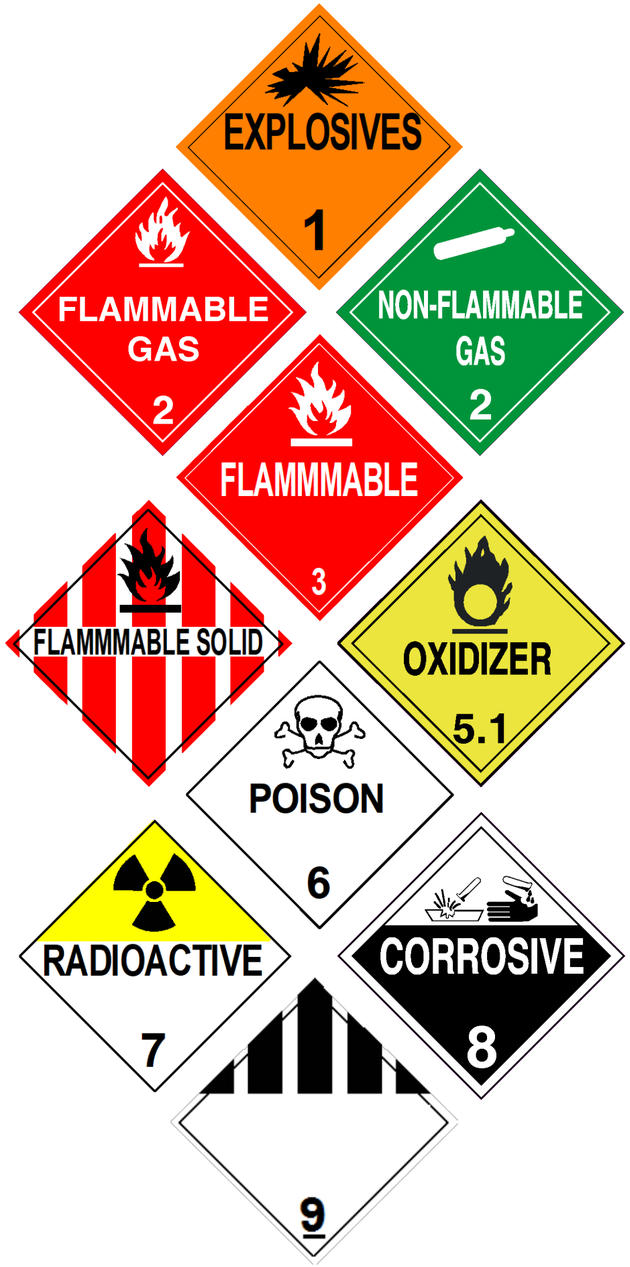
- Used to identify the hazards of a material and the degree of severity of the health, flammability, and instability (reactivity) hazards.

- Primarily used to mark bulk containers and buildings that contain hazardous materials above certain quantities.



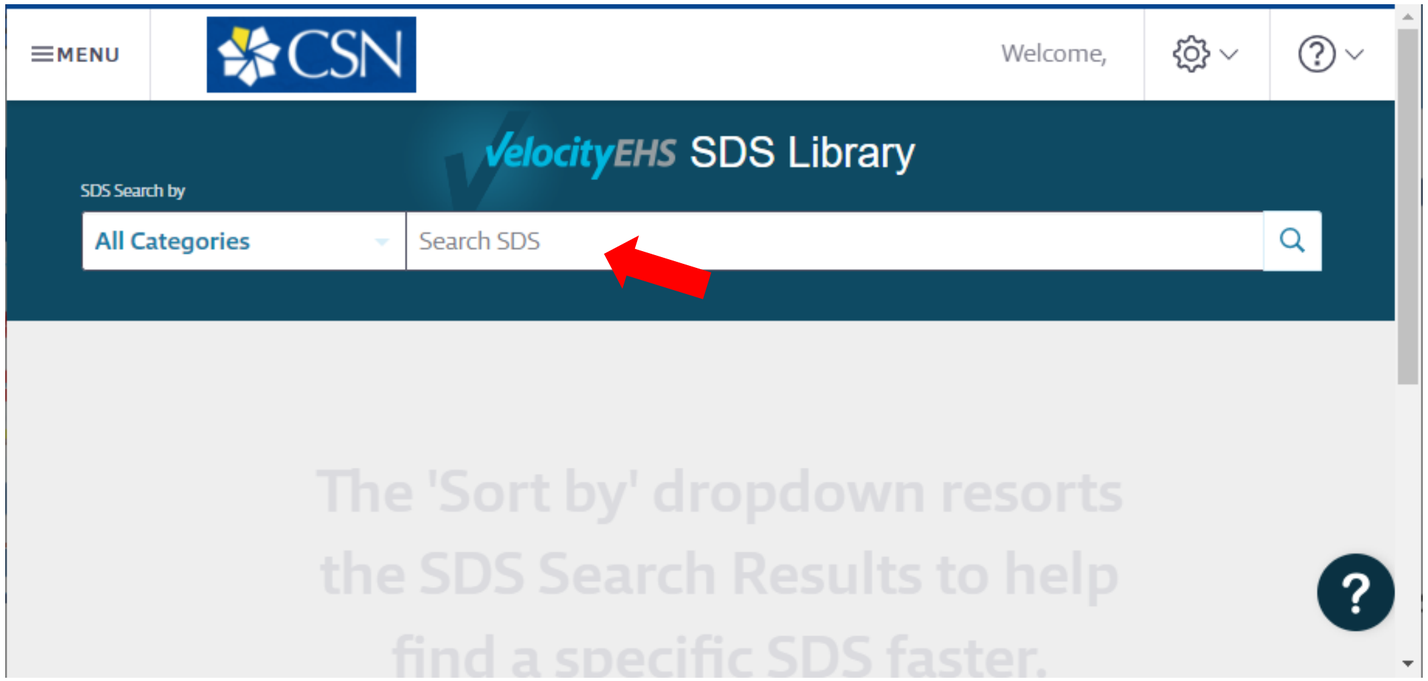
DOT Hazard Class Labels

- Communicate the hazard(s) within a shipping container.
- Nine (9) Hazard Classes:
  - Explosives
  - Compressed Gases
  - Flammable Liquids
  - Flammable Solids
  - Oxidizers
  - Poisons
  - Radioactive Materials
  - Corrosives
  - Miscellaneous
- Labels must remain on the container if the original manufacturers container will be used.



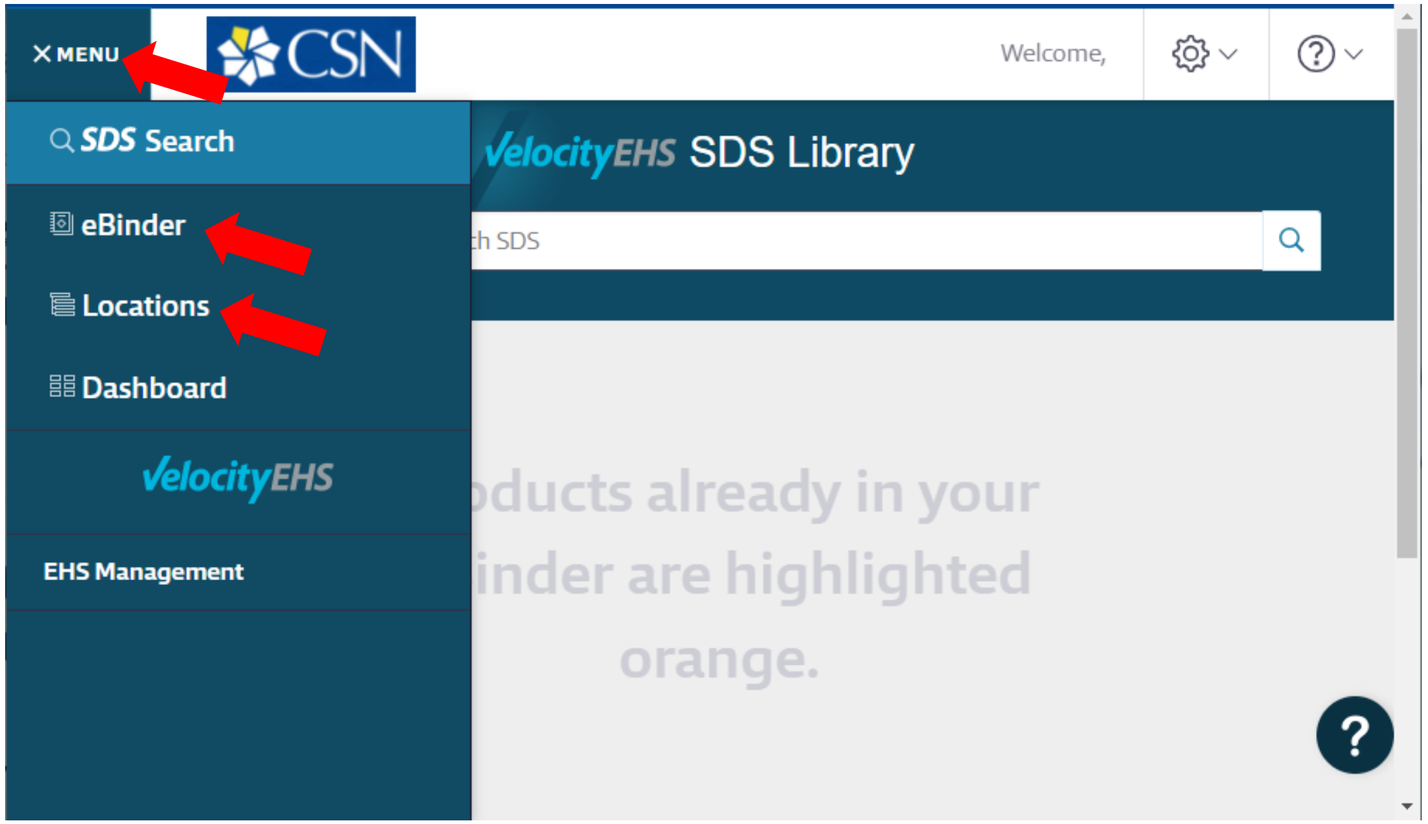
Safety Data Sheets (SDS)

- SDS provide comprehensive information on a hazardous substances or mixtures used in the workplace.
- CSN Safety Data Sheets (SDS) Library: https://www.csn.edu/environmental-health-safety



- Start your search by entering the material name in the main search field.
- This field searches all SDS's in the entire VelocityEHS database.

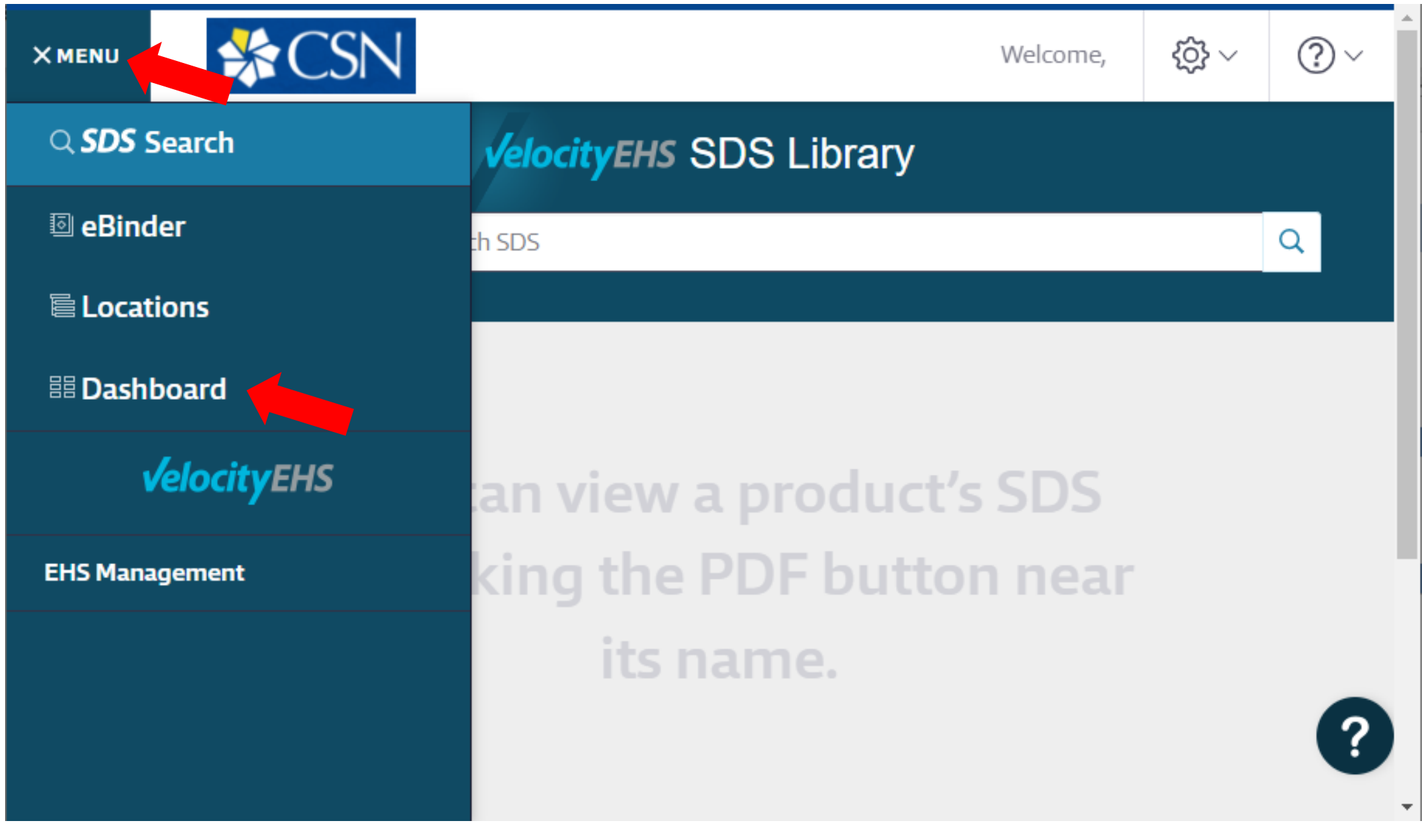
Safety Data Sheets (SDS)



For specific SDS searches of materials located on CSN Campuses, click on the **Menu** link in the upper left corner of the screen, then click on the **eBinder** or **Locations** links.

- **eBinder** provides a list of all SDS's based on current CSN Chemical Inventories.
- **Locations** provides a search of SDS's for materials located in specific rooms or areas on each campus.

CSN Library System Resources



Additional SDS Library Resources can be found by clicking on the **Dashboard** link.

Resources include:

- Announcements
- Videos and handouts on how to use the CSN Library System
- Handout on how to print secondary chemical container labels

Chemical Storage and Handling

- Keep containers closed unless you are working with container.
- Segregate chemicals according to hazard (i.e. flammables separate from oxidizers, acids separate from bases).
- Avoid storing chemicals on top of cabinets or on the floor.
- Do not expose chemicals to heat or direct sunlight.
- Inspect for leaking or open containers

Flammable Liquids

- Store flammable liquids in an approved storage cabinets. No more than 3 storage cabinets per control area.
- Limit storage outside of cabinets to less than 5-10 gallons.
- DO NOT store flammable liquids in a refrigerator unless it is approved for such storage. Such refrigerators are designed with non-sparking components to avoid an explosion.
- DO NOT evaporate solvents as a means of disposal.

Corrosive Materials

- DO NOT store acids and bases together.
- Material should be stored in cabinets.
- Store containers in corrosion resistant storage trays to capture leaks.
- Store heavy containers on lower shelves.
- Store on shelves with raised edges.
- Do not store corrosive materials above eye level.

Compressed Gases

- Chain or strap cylinder to wall/bench.
- Always use a cart & safety chain when transporting cylinder.
- Store flammable gas lecture bottles in flammable storage cabinet.
- Keep non-compatible gases separate.
- Store oxygen more than 20 ft. from flammable gases.

Transporting Chemicals

- Movement of chemicals must be negotiated carefully.
- Avoid moving chemicals when hallways are busy.
- Use a container-within-a container method using a larger chemically resistant or another container designed for carrying chemicals.
- Transfer only small quantities into glass, plastic or non-electrically conductive containers.
- Transport compressed gas cylinders using a cylinder cart with a valve cover cap.

Housekeeping

- Always keep the laboratory neat and free of clutter.
- Do not block sinks, eyewashes, emergency showers and fire extinguishers.
- Aisles and corridors should be free of tripping hazards.
- Limit the use of extension cords and avoid overloading electrical circuits.
- Avoid using carts to store chemicals and other equipment.
- Dispose of broken or chipped glassware.

Personal Hygiene

- Never prepare or consume food or beverages in the lab.
- Do not apply cosmetics in the lab.
- Avoid touching your face with your gloved hand.
- Remove gloves and wash hands before leaving a lab.
- Never wear lab coats where food is consumed.
- Never pipette by mouth, use a pipette aid or suction bulb.

Personal Protective Equipment

Equipment worn to minimize exposure to a variety of hazards.

Protective Clothing

- Lab coats and aprons protect major portions of the body from chemical contact.
- Use a coat specially made of materials resistant to chemicals in use.
- Hang lab coats in lab area, never wear outside a lab, to avoid risks of contamination.
- Wear closed toe shoes. Open toe sandals are not allowed.

Protective Gloves

- Use the right gloves (appropriate material)
- Glove selection should be applied to the chemical you are using.
- Know the physical Limitations:
  - Puncture & Cut Resistance
  - Flame & Heat Resistance
  - Cryogenic Liquids
  - Dexterity Issues
- Review the SDS for proper glove selection.

Glove choices:

- Disposable latex
- Disposable nitrile
- Disposable vinyl
- Natural rubber latex
- Nitrile
- Butyl
- Viton ii

Eye Protection

- Eye protection is required when working in laboratories. Using the appropriate eye protection is critical.
- Eyeglasses, goggles and face shields can assist in preventing fumes or particles as well as liquids from entering your eyes.
- Review the SDS for proper eye protection selection.

Chemical Emergencies

When chemical emergencies occurs, seconds count!

Eye Wash & Shower Stations

- Before beginning work, know the location of the closest safety shower and/or eye wash station and ensure it is operating.
- Keep access to the eyewash station open in the event of an accident.
- If eyes or skin is exposed, remove contaminated clothing immediately. Flush eyes or skin for a minimum of 15 to 20 minutes.
- Remove contacts, if possible. If not, continue to flush the eyes.
- Seek medical attention immediately.

Small Spills

- Spills that represent a low risk to personnel and the environment.
- Spills that are contained, isolated, or in a fume hood.
- Spills that can be adsorbed and controlled at the time of release by employees working in the area.
- The spill will not reach a floor drain.
- The spill can be cleaned up using absorbents or paper towels wearing basic PPE to prevent skin and eye contact such as gloves and eye protection.

Large Spills

- Spills that have the potential to harm the environment or represent a risk to human health, fire/explosion hazard, or unknown chemicals.
- Spills that are outside a fume hood or that spread to public spaces (e.g., hallways).
- These spills must be addressed by trained emergency responders that have the appropriate personnel protective equipment.
- Never put yourself or others at risk to cleanup a high hazard spill.

Response Actions

- Notify your fellow workers and supervisor.
- Report spills as soon as possible.
- Control Access to the area, prevent contact or spread of spill.
- Protect floor drains or other means of environmental release.
- Don personal protective equipment, as appropriate to the hazards.
- Place spill control materials over the entire spill area, working from the outside, circling to the inside.
- Place spilled absorbed materials in an appropriate container.
- Decontaminate the spill area with mild detergent and water.

Emergency Notification

University Police Services is the first contact and first responder for **ALL on-campus emergencies!**

EMERGENCY

- Campus phone: **7-911**
- Cell phone: **702-895-3669**
- **CSN Mobile Safety App**: “University Police 9-1-1” button
- Campus Emergency Call Boxes (parking lots)
- Campus Emergency Red Phones (classrooms)
- Activate a duress button (designated areas)

NON-EMERGENCY

- Campus phone: 7-311
- Cell Phone: 702-895-3668
- **CSN Mobile Safety App**:
  - “Non-Emergency 3-1-1” button
  - Text-Chat with Dispatch
  - Report an Anonymous Tip

Call **University Police Services** for immediate medical and/or public safety emergency assistance.

See Something, Say Something - Avert Preventable Emergencies

Report all incidents and injuries (no matter how minor)

Report to EHS

- ❑ **Safety Concerns, Unsafe Conditions, or Near Misses**
  - via EHS webpage or Incident Reporting webpage
  - email EHS@csn.edu
  - call EHS at **702-651-7445** (x7445)
- ❑ **Injuries, Illnesses, or Exposures**
  (employees, students, contractors, and visitors)
  - Reporting requirements vary depending on the incident type, follow **step-by-step instructions** on the EHS Incident Reporting Webpage.
  - !! Call **University Police Services** for immediate medical emergency assistance!
- ❑ **Reportable Chemical Spills and Releases**
  - Chemical spills over one gallon or one pound
  - Spill of mercury (any size)
  - Any uncontrolled gas release
  - Any chemical or oil released to bare ground, sewer, or surface water
  - Exposure to hazardous chemicals and materials
  - !! Call **University Police Services** for immediate emergency assistance!

Report to University Police Services

- ❑ **Call for immediate medical and/or public safety emergency assistance.**
- ❑ **File a Police Report**
  - ❑ Call non-emergency dispatch
  - ❑ Submit Online Incident Report Form
- ❑ **Anonymous Police Tip**
  - Call non-emergency dispatch
  - via CSN MobileSAFETY App
  - via Online Crime Tip Form

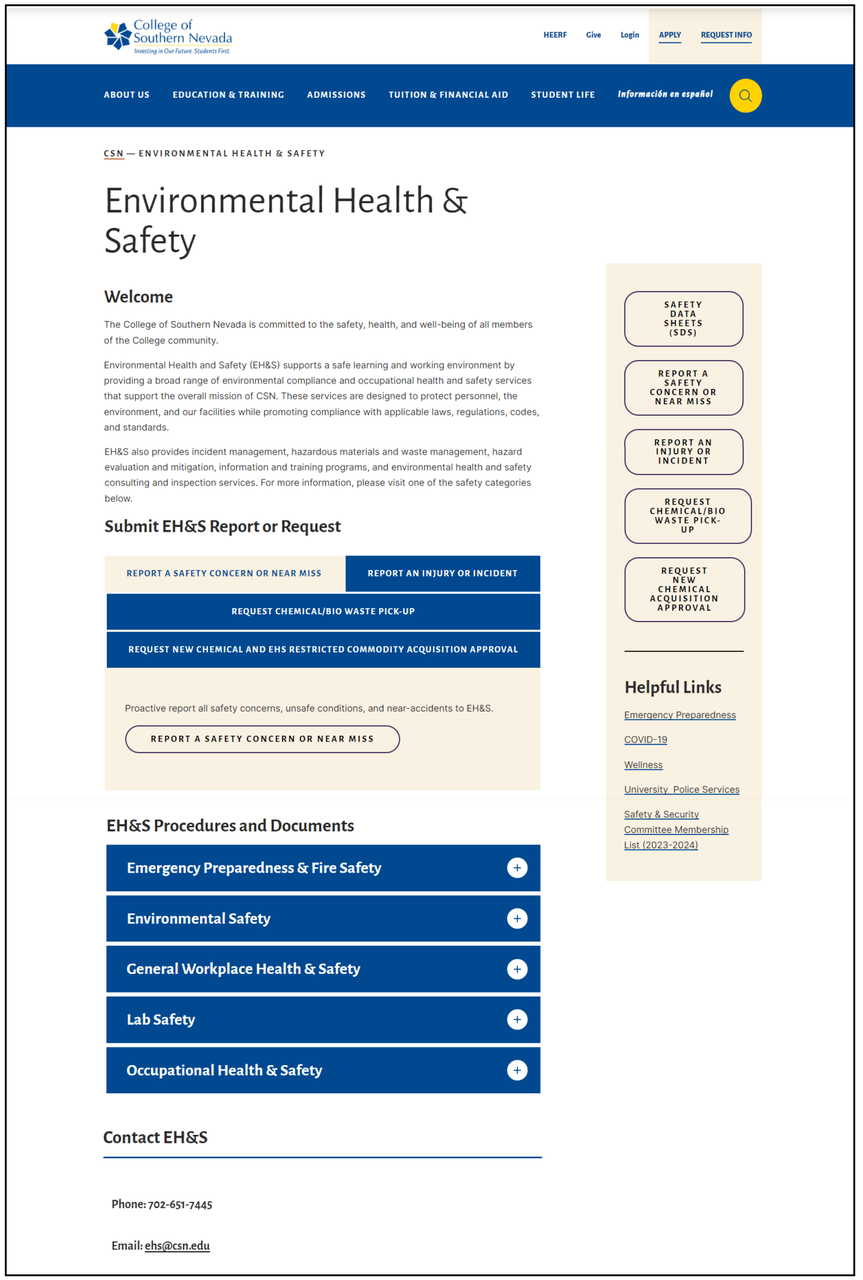
Report to Facilities Management

- ❑ **Facilities Issues**
  (unsafe building conditions, problems with the building infrastructure, or property damage)
  Submit work request to Facilities Management
  - via iServiceDesk on the Facilities Management webpage
  - MobileSAFETYApp
  - call 702-651-4888 (x4888

EH&S Website

- Safety Data Sheets
- Report Safety Concerns or Near Misses
- Report an Injury or Incident
- Request Chemical/Bio Waste Pickups
- Request new Chemical Acquisition Approvals
- EH&S Procedures and Documents:
  - Emergency Preparedness & Fire Safety
  - Environmental Safety
  - General Workplace Health and Safety
  - Lab Safety
  - Occupational Health and Safety

https://www.csn.edu/environmental-health-safety



Questions
&
Quiz
https://rb.gy/e4r8zk

College of Southern Nevada

Investing in Our Future. Students First.